

**REMARKS**

Reconsideration of the above-identified application in view of the present amendment is respectfully requested.

By the present amendment, claim 33 was amended to include the limitations of claim 40. Claim 40 was cancelled. Additionally, claim 45 has been withdrawn from consideration.

Below is a discussion of the 35 U.S.C. §102(e)/§103(a) rejection of claims 33 and 35-44, the 35 U.S.C. §103(a) rejection of claims 33 26-42 and 44, and the 35 U.S.C. §103(a) rejection of claims 33 and 35-44.

**1. 35 U.S.C. §102(e)/103(a) rejection of claims 33 and 35-45.**

Claims 33 and 35-44 were rejected under 35 U.S.C. §102(e) as being anticipated by Martin et al. or under 35 U.S.C §103(a) as being unpatentable over Martin et al.

Claims 33 and 35-45 are neither anticipated by nor obvious in view of Martin et al. because Martin et al. do not teach or suggest an electrically actuatable igniter that includes an ignition material comprising uniformly dispersed mixture of a metal powder and a particulate oxidizer, having an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ , and that is free of a binder. Moreover, Martin et al. do not teach that the ignition material does not thermally decompose at temperatures up to about 120°C.

Martin et al. teach that nano-aluminum powder and a particulate oxidizer are combined to form a propellant mixture and that the propellant mixture is ignited by a hot wire igniter. Martin et al., however, do not teach that the propellant mixtures ignited by the hot wire igniter comprise uniformly dispersed mixtures of a metal powder and a particulate oxidizer that are free of binders nor is this ignition material obvious in view of Martin et al.

Martin et al. teach that the oxidizer is in the form of a matrix. The term matrix is defined at column 4, lines 26-35, as follows:

“The term “matrix” refers to the solid state of the oxidizer wherein one or more metallic fuel particles are substantially encapsulated or embedded within the solid structure, much like the holes in a piece of foam... As such, in preferred embodiments, the metallic fuel particles are generally uniformly distributed throughout the matrix of solid oxidizer.”

Thus, Martin et al. teach that the oxidizer encapsulates the metallic fuel particles and is not in the form of uniformly dispersed particles.

This supported by Examples 1-4, which teach forming propellant mixtures, which are free of binder, from nano-aluminum powder and particulate ammonium perchlorate. The ammonium perchlorate in these examples is dissolved in a solution to which the nano-

aluminum powder is added. The dissolved ammonium perchlorate and nano-aluminum powder are precipitated out of solution to form dry agglomerates of ammonium perchlorate/nano-aluminum matrix. (Column 11, lines 55-57). Agglomerates of ammonium perchlorate/nano-aluminum matrix are not uniformly dispersed metal powders and particulate oxidizer. More particularly, Martin et al. do not teach that agglomerates of ammonium perchlorate/nano-aluminum matrix are uniformly dispersed mixtures of metal powder and oxidizer having an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ .

Moreover, in Examples 6-8, Martin et al. teach mixing agglomerates of ammonium perchlorate/nano-aluminum matrix of the previous example with particles of ammonium perchlorate and a binder to form a propellant. Claim 33, however, specifically recites that the ignition material is free of a binder. Claim 42, the other independent claim, recites that the ignition material consists essentially of the metal powder and the particulate oxidizer, which precludes the addition of the binder taught in Martin et al. Thus, a binder is required in the Examples (6-8) where particulate ammonium perchlorate is used. Therefore, the compositions in Examples 6-8 do not meet the claims because they require a binder.

The Office Action argues that to the extent necessary it is obvious to eliminate an element and its function and therefore it would be obvious to eliminate the binder from the composition. It would not be obvious to eliminate the binder from the propellant composition because the binder is required to form the propellant composition. The binder acts a glue to hold the particles of ammonium perchlorate together with the agglomerates of ammonium perchlorate/nano-aluminum matrix. Without the binder there would be no need for the particulate ammonium perchlorate that is combined with the agglomerates. Accordingly, it would not be obvious to eliminate the binder and if the binder were eliminated there would be no need to use the particulate ammonium perchlorate.

Additionally, Martin et al. provide no suggestion or teaching that the ignition composition is thermally stable up to 120°C. Further, one skilled in the art would not expect the compositions in Martin et al. to have same properties as the composition of claim 33. As noted on page 13 of the specification, the reactivity oxidizer/electro-exploded metal mixture is a function of the particle size of oxidizer. The composition of claim 33 comprise uniformly dispersed of particles of oxidizer and electro-exploded metals not particles of electro-exploded metals that are encapsulated an oxidizer. Since these compositions comprise different physical forms of oxidizer one skilled in the are would not necessarily expect that the composition of Martin et al. would behave similarly to the composition of claim 33. Thus, Martin et al. do not teach or suggest all of the limitations of claims 33 and 42. Therefore, withdrawal of this rejection is respectfully requested.

Claims 35-39 and 41 depend either directly or indirectly from claim 33 and therefore should be allowable for the same reasons recited with respect to claim 33 and for the specific limitations recited in claims 35-39 and 40.

Claims 43-44 depend either directly or indirectly from claim 42 and therefore should be allowable for the same reasons recited with respect to claim 42 and for the specific limitations recited in claims 43 and 44.

**2. 35 U.S.C. §103(a) rejection of claims 33, 36-42, and 44**

Claims 33, 36-39, 41, 42, and 44 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kelley et al., in view of Higa et al., Martin et al., Dixon et al., Wheatley, and Lundstrom.

Claim 33 is patentable over Kelley et al. in view of Higa et al., Martin et al., Wheatley, and Lundstrom. because: (1) Kelley et al. in view of Higa et al., Martin et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material that includes an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to vary the particle size of the oxidizer in Kelley et al. based on the teachings of Higa et al., Martin et al., Dixon et al., Wheatley, and Lundstrom and the holdings of In re Boesch and In re Aller.

Kelley et al., as noted in the Office Action teach a thermite composition in contact with a bridgewire of an electrically actuated igniter, comprising a pair of electrodes, a bridge wire and an ignition material of thermite. The thermite composition includes iron oxide having a particle size of about 0.5 microns and aluminum, having a particle size of about 1 micron. Kelley et al. do not teach that the aluminum is an electro-exploded metal powder, the oxidizer has a particle size between about 1 and about 30 microns, and that the particles sizes of the aluminum and the iron oxide can be adjusted.

Higa et al. teach that fine aluminum particles having particle sizes less than about 3000 nm can be used in a pyrotechnic composition or thermite. Higa et al. teach that the fine aluminum particles can be formed by electro-exploding aluminum wire. Higa et al. do not teach that the thermite includes an oxidizer having a particle size between about 1 micron and about 30 micron or that it would be desirable to use fine aluminum particles with an oxidizer that has a particle size between about 1 micron and about 30 microns.

Martin et al., as noted above, teach agglomerates of ammonium perchlorate/nano-aluminum matrix and composites of ammonium perchlorate, nano-aluminum particles, and binder that can be used in a propellant mixture. Martin et al. do not teach or suggest that the particle size of an oxidizer used in a thermite composition ranges from about 1 microns to about 30 microns and that it would be desirable to use an oxidizer that has a particle size

between about 1 and about 30 microns if nano-aluminum particles are used. Moreover, Martin et al. do not teach the desirability of using a nano-aluminum powder in a thermite composition.

Wheatley teaches a gas generating composition that includes an ammonium nitrate or a strontium nitrate based oxidizer mixture. (Column 2, lines 21-23). The gas generating composition also includes exploded aluminum powder. The exploded aluminum powder is used as a combustion modifying additive to increase the burning rate and lower the pressure exponent of the ammonium nitrate or strontium nitrate gas generating composition. (Column 3, lines 31-35).

Wheatley does not teach that the oxidizer has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ . Moreover, it would not have been obvious to use the electro-exploded powder taught in Wheatley in the ignition compositions taught in Baginski and Halcomb et al. Wheatley teaches using exploded aluminum as an additive to an ammonium nitrate based gas generating composition to lower the pressure exponent and increase the burning rate of the ammonium nitrate gas generating composition. The ignition compositions taught in Kelley et al., however, do not include ammonium nitrate and would therefore not have a high pressure exponent and a low burning rate, which is caused by ammonium nitrate. Hence, there would be no reason to add electro-exploded aluminum to the ignition compositions of Kelley et al.

Lundstrom teaches a chlorate free auto-ignition composition that includes an azodiformamidine dinitrate, an oxidizer, and an accelerator. The accelerator used in conjunction with the azodiformamidine dinitrate preferably includes a fine iron oxide powder, which has an average particle size of about 3 nm.

Lundstrom does not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Lundstrom also does not teach using an oxidizer that has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ .

Thus, Kelley et al. in view of Higa et al., Martin et al., Wheatley, and Lundstrom do not teach or suggest an ignition material that includes an oxidizer that has a particle size of about 1 to about 30 microns.

Additionally, the about 1 micron to about 30 micron particle size of the oxidizer would not be obvious based on the holdings of In re Boesch and In re Aller. The holdings of In re Boesch and In re Aller provide that where the general conditions of a claim are known it is not inventive to discover the optimum or workable ranges by routine experimentation. The cited references, i.e., Kelley et al. in view of Higa et al., Martin et al., Wheatley, and Lundstrom, however, do not teach or suggest the general conditions of claim 33. Nowhere in

Kelley et al., Higa et al., Martin et al., Wheatley, and Lundstrom is it disclosed to provide the fuel portion (*i.e.*, the electro-exploded metal powder) with a very small particle size and the oxidizer with a much greater particle size (*i.e.*, about 1 micron to about 30 microns). More specifically, none of the above noted references teach or suggest it is advantageous or desirable to experiment with the particle size of an oxidizer for autoignition material when used with an electro-exploded metal powder. The present invention found that this was necessary for ignition materials to prevent the auto-ignition of the ignition powder as a result of external stress, such as shock. So absent a disclosure of these "general conditions", the particle size of the oxidizer used in the ignition material would not be obvious. Thus, claim 33 is not obvious over Kelley et al., Higa et al., Martin et al., Wheatley, and Lundstrom. Therefore, allowance of claim 33 is respectfully requested.

Claims 36-39 and 41 depend either directly or indirectly from claim 33 and therefore should be allowable for the same reasons recited with respect to claim 33 and for the specific limitations recited in claims 36-39 and 41.

Claim 42 contains limitations similar to claim 33 and therefore should be allowable for the same reasons as claim 33 and for the specific limitations recited in claim 42.

Claim 44 depends directly from claim 42 and therefore should be allowable for the same reasons recited with respect to claim 42 and for the specific limitations recited in claim 44.

### **3. 35 U.S.C. §103(a) rejection of claims 33 and 35-45**

Claims 33 and 35-39, and 41-44 were rejected under 35 U.S.C. 103(a) as being unpatentable over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom.

Claim 33 recites an electrically actuatable igniter that comprises a pair of electrodes, a heating element electrically connected between said electrodes, and an ignition material in contact with said heating element. The ignition material comprises a uniformly dispersed mixture of a metal powder and a particulate oxidizer that exothermically reacts with the metal powder. The oxidizer has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ . The metal powder is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. The ignition material deflagrates when the heating element is heated to a temperature of at least about 250°C. The ignition material is also free of a binder.

Claim 33 is patentable over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom because: (1) Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically

actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Baginski, as noted in the Office Action, teaches the basic invention of explosive primers with a pyrotechnic mix around a bridgewire. The pyrotechnic compound can include zirconium and potassium perchlorate, or alternatively other pyrotechnic compounds, such as titanium hydride potassium perchlorate and boron potassium nitrate.

Baginski does not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Baginski also does not teach using an oxidizer that has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ .

Halcomb et al. teach a thermite composition that uses a finely divide aluminum powder and a metal oxide such as iron oxide, copper oxide, tungsten oxide, or chromium oxide.

Halcomb et al. do not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Halcomb et al. also do not teach using an oxidizer that has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ .

Dixon et al. teach a lead free combustion primer that includes a metastable interstitial composite. The metastable interstitial composite includes aluminum and molybdenum trioxide having a particle size of about 0.1  $\mu\text{m}$  or less.

Dixon et al. do not teach a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Dixon et al. only disclose that the aluminum particles have a particle size of less than 0.1  $\mu\text{m}$  not that they are formed by electro-explosion. As noted above and in the specification, electro-exploded metals form nano-sized particles that agglomerate into micron-sized powders. Dixon et al. neither disclose nor suggest that the aluminum particles in Dixon et al. have this feature. Dixon et al. only discloses that the particles form metastable interstitial composites.

Moreover, Dixon et al. state that the particle size of the oxidizer (i.e.,  $\text{MoO}_3$ ) is preferably less than  $0.1\ \mu\text{m}$ . Whereas, in the invention recited in claim 1, the oxidizer has a particle size of about  $1\ \mu\text{m}$  to about  $30\ \mu\text{m}$ .

Wheatley teaches a gas generating composition that includes an ammonium nitrate or a strontium nitrate based oxidizer mixture. (Column 2, lines 21-23). The gas generating composition also includes exploded aluminum powder. The exploded aluminum powder is used as a combustion modifying additive to increase the burning rate and lower the pressure exponent of the ammonium nitrate or strontium nitrate gas generating composition. (Column 3, lines 31-35).

Wheatley does not teach that the oxidizer has an average particle size of about  $1\ \mu\text{m}$  to about  $30\ \mu\text{m}$ . Moreover, it would not have been obvious to use the electro-exploded powder taught in Wheatley in the ignition compositions taught in Baginski and Halcomb et al. Wheatley teaches using exploded aluminum as an additive to an ammonium nitrate based gas generating composition to lower the pressure exponent and increase the burning rate of the ammonium nitrate gas generating composition. The ignition compositions taught in Baginski and Halcomb et al., however, do not include ammonium nitrate and would therefore not have a high pressure exponent and a low burning rate, which is caused by ammonium nitrate. Hence, there would be no reason to add electro-exploded aluminum to the ignition compositions of Baginski and Halcomb et al.

The Office Action suggests that one using the electro-exploded aluminum in a similar pyrotechnic composition would expect similar results, and therefore its substitution would have been obvious. The pyrotechnic compositions taught in Baginski and Halcomb et al. are not similar pyrotechnic compositions to the gas generating composition taught in Wheatley. The pyrotechnic compositions taught in Baginski and Halcomb et al. are primary ignition composition that use a metal as the primary fuel in combination with an oxidizer. The composition of Wheatley, in contrast, is a gas generating composition that includes an organic fuel, an oxidizer, and a metal additive. It is mere speculation, at best, whether the addition of a metal additive, which is used to increase the burning rate and lower the pressure exponent of a gas generating composition, would also increase the burning rate and lower the pressure exponent of an ignition composition. Further, there is nothing in the prior art that suggests that that the addition of electro-exploded aluminum to a pyrotechnic composition would even be desirable.

Lundstrom teaches a chlorate free auto-ignition composition that includes an azodiformamidine dinitrate, an oxidizer, and an accelerator. The accelerator used in conjunction with the azodiformamidine dinitrate preferably includes a fine iron oxide powder, which has an average particle size of about  $3\ \text{nm}$ .

Lundstrom does not teach an ignition material that includes a metal powder selected from the group consisting of ~~electro-exploded aluminum powder~~, electro-exploded titanium powder, electro-exploded ~~copper~~ powder, electro-exploded ~~zinc~~ powder, and electro-exploded yttrium powder. Lundstrom also does not teach using an oxidizer that has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ .

Thus, claim 33 is not obvious over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom. Therefore, allowance of claim 33 is respectfully requested.

Claim 35 depends from claim 33 and further recites that the oxidizer is selected from the group consisting of alkali metal nitrates, alkaline earth metal nitrates, alkali metal perchlorates, alkaline earth metal perchlorates, alkali metal chlorates, alkaline earth metal chlorates, ammonium perchlorates, ammonium nitrate, and mixtures thereof.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is electro-exploded aluminum, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 34 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 34.

Claim 36 depends from claim 33 and further recites that the electro-exploded metal powder is electro-exploded aluminum.

As noted above with respect to claim 36, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is electro-exploded aluminum, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 36 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 36.

Claim 37 depends from claim 33 and further recites that the electro-exploded metal powder is about 15% to about 75% by weight of the ignition material.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of



electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 37 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 37.

Claim 38 depends from claim 33 and further recites that the amount of oxidizer is about 25% to about 85% by weight of the ignition material.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 38 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 38.

Claim 39 depends from claim 33 and further recites that the ignition material upon deflagration produces an ignition product with a temperature of about 3000°C to about 6000°C.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Moreover, none of the references disclose or suggests an ignition material, which upon deflagration, produces an ignition product with a temperature of about 3000°C to about 6000°C. The only reference that discloses a temperature, is Wheatley. Wheatley, however, teaches that the combustion temperature is below 2300K.

Therefore, claim 39 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 39.

Claim 40 depends from claim 33 and further recites that the ignition material does not thermally decompose at temperatures up to about 120°C.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 40 is allowable for the same reasons as claim 1 and for the specific limitations recited with respect to claim 40.

Claim 41 depends from claim 1 and further recites that the metal powder has a surface area of about 15 square meters per gram.

As noted above with respect to claim 41, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 41 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 41.

Claim 42 recites an electrically actuatable igniter that comprises a pair of electrodes, a heating element electrically connected between the electrodes, and an ignition material in contact with the heating element. The ignition material consists essentially of a uniformly dispersed mixture of a metal powder and a particulate oxidizer. The metal powder comprises about 25% to about 50%, by weight of the ignition material. The oxidizer has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ . The metal powder consists of electro-exploded aluminum powder and the ignition material deflagrates when the heating element is heated to a temperature of at least about 250°C.

Claim 42 contains limitations, which are similar, to the limitations recited in claim 33. As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Moreover, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose that the metal powder comprises about 25% to about 50% by weight of the ignition material and the oxidizer comprises about 50% to about 75% by weight of the ignition material.

Baginski and Halcomb et al. do not teach the percentages of the metal fuel and the oxidizer in each of their respective ignition compositions. Dixon et al. teach aluminum at a percentage of 45% and  $\text{MoO}_3$  at a percentage of 55%; however, Dixon et al. do not teach that the aluminum is electro-exploded or that the  $\text{MoO}_3$  has a particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ . Wheatley teach adding electro-exploded aluminum to a gas generating composition, but only in a weight percentage of up to 20% by weight of the gas generating material. Likewise, Lundstrom teach adding super fine iron oxide to a gas generating composition, but only in an amount of up to about 10%.

Therefore, claim 42 is patentable over the Baginski in view of Halcomb et al. Dixon et al., Wheatley, and Lundstrom and allowance of claim 42 is respectfully requested.

Claim 43 depends from claim 42 and further recites that the oxidizer is selected from the group consisting of alkali metal nitrates, alkaline earth metal nitrates, alkali metal perchlorate, alkaline earth metal perchlorates, alkali metal chlorates, alkaline earth metal chlorates, ammonium perchlorate, ammonium nitrate, and mixtures thereof.

As noted above with respect to claim 42, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would

not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 43 is allowable for the same reasons as claim 42 and for the specific limitations recited in claim 43.

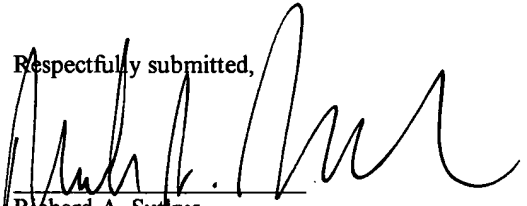
Claim 44 depends from claim 42 and further recites that the ignition material upon deflagration produces an ignition product with a temperature of about 3000°C to about 6000°C.

As noted above with respect to claim 42, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1  $\mu\text{m}$  to about 30  $\mu\text{m}$ ; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 44 is allowable for the same reasons as claim 42 and for the specific limitations recited in claim 44.

In view of the foregoing, it is respectfully submitted that the above-identified application is in condition for allowance, and allowance of the above-identified application is respectfully requested.

Please charge any deficiency or credit any overpayment in the fees for this amendment to Deposit Account No. 20-0090.

Respectfully submitted,

  
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